Literature Review

Using VoiceThreads to Write Digital Lab Reports and Engage Middle School Students

Content areas have writing specific to each of them. One genre of writing specific to science is the lab report. Lab reports may be simple fill-in-the-blank worksheets or detailed experiment documentations. Middle school science teachers have students write lab reports to record what happens in class experiments along with what was learned from the experiences. Frequently middle school students write poor lab discussions or do not write discussions at all, thereby not completing the reports. Digital lab reports, specifically VoiceThreads, have the potential to encourage students to write better discussions and complete the writing of lab reports by giving students word processing tools and the creative license to incorporate media of their choosing.

This literature review explores topics associated with digital lab reports and VoiceThreads. First, definitions are established for lab report, lab report discussion, digital lab report, and VoiceThread. Next, the use of digital lab reports in middle school classrooms is examined. Finally, an argument is given to why VoiceThreads were chosen.

Definitions

Lab Report

The term lab report is not clear-cut. It is part of a genre of science writing shared with lab notebooks and lab journals.

Lab notebooks range from notes taken on a sheet of paper (Carter, Ferzli, & Wiebe, 2004) to bound journals permanently documenting lab experiments (Dartmouth College, 2004). Whether informal or formal, notebooks are used to learn. Informal notebooks may contain observations, data or facts acquired from inquiry investigations, but they may also include questions, predictions and conclusions. Notes about readings and class discussions are common

(Michigan Department of Education, 2009). Informal notebooks tend to be part of a K-12 science curriculum, where pages on the left side of notebooks are used to "personally connect with the information on the attached right side page" (Chesbro, 2006, p.33). The right side of pages includes information from lectures, readings, videos, and labs, while the left side of pages includes graphic organizers, pictures, drawings; anything to help students make connections to previous learning (Chesbro, 2006). Formal lab notebooks are permanent records found in college and professional settings. All entries in these notebooks are in ink and clearly dated. Changes and deletions are made by drawing single lines through entries or "x's" through sections of the notebook (Dartmouth College, 2004). These notebooks contain information on discussions, experiment ideas and goals, experiment details, calculations, photos, co-workers participating in the work, and data files (Purrington, 2009). Engineers can use this information as legally admissible evidence in patent claims as well (McCormack, Morrow, Bare, Burns, & Rasmussen, 1991).

A lab journal does not have the "extras" found in a lab notebook. It is a collection of lab investigations (LaRosa, 2010) that documents lab experiences and observations, and asks students to reflect about the labs. It is primarily seen in grades K-12 and sometimes called a lab notebook (McDonald & Dominguez, 2009). The reflections may begin with prompts from instructors such as "What is something I discovered for the first time or something surprising? How do I feel? What am I reminded of? What am I wondering now?" (Bricker, 2007, p.26), or the reflections are open to students writing down connections they make with previous learning (Chesbro, 2006; McDonald & Dominguez, 2009).

Lab reports document one particular investigation. They are "simple fill-in-the-blank to very sophisticated reports" (Carter et al., 2004, p.399), that take on more rigid formats which

include specific parts. The complexity of the reports is determined by the context in which the reports are written. The literature delineates lab reports into two basic outlines:

Lab Report 1	Lab Report 2
• Title	• Title
• Abstract	• Problem
• Introduction	• Hypothesis
• Materials and methods	• Materials
• Results	• Procedure (methods)
• Discussion	• Results
• Literature cited	• Discussion

Lab report 1 is the outline used by college students and engineering professionals (Carter et al., 2004; Dolphin, 1997; McCormack et al., 1991; University of Arizona, 2002). Lab report 2 can be seen at the college level (Krantz, n.d.), but it is used most often in middle schools and high schools (Bloch, 2009; Diaz, 2004; Helmenstine, 2010; Muskopf, n.d.; Sitar, 2004). This study will follow the lab report 2 outline.

Lab Report Discussion

Where lab notebooks, lab journals, and lab reports have distinct identities, this is not seen with the terms discussion and conclusion. They are almost interchangeable in the literature. The end of a lab report is called the analysis, discussion, conclusion or a combination of these terms. Helmenstine (2010) and Carter et al. (2004) include a discussion and a conclusion section. Burke, Greenbowe, & Hand, (2006) and Krantz (n.d.) call this section the discussion while Diaz (2004) calls it the conclusion and Bloch (2009) asks students to "discuss the following:" (¶ 11) within the conclusion. See Table 1.

Table 1

Comparison of Discussions and Conclusions Among College, High School (HS) and Middle School (MS) Instructors

Author	Discussion	Conclusion
Helmenstine (HS, college)	▪ Accept or reject hypothesis (analysis of data is a separate section) ▪ Discuss mistakes ▪ Make suggestions for improvement	▪ Summation of what happened
Carter et al. (College)	▪ Accept or reject hypothesis ▪ Use specific data to support or reject ▪ Discuss mistakes ▪ Make suggestions for improvement	▪ Summation of what happened
Burke (College)	▪ State what can be claimed using specific data	
Krantz (College)	▪ Analyze results ▪ Accept or reject hypothesis ▪ State how the original problem was resolved	
Diaz (MS)		▪ Accept or reject hypothesis ▪ Specify data to support or reject ▪ Discuss mistakes ▪ Make suggestions for improvement ▪ State what the experiment taught
Bloch (MS)		Discuss the following: ▪ Give a brief recap of the question and hypothesis. ▪ Was your hypothesis correct? ▪ What happened and why? ▪ Were there any difficulties with the experiment? ▪ Is there any reason to disbelieve your results? ▪ How could you improve the experiments? ▪ Do these results suggest any follow-up experiments?

The two middle school authors cited use the term conclusion, yet discussion is key to what every author requires in this section of the lab report. Therefore, this part of the student lab report will be called *lab report discussion*.

Digital lab report

A digital lab report is not synonymous with an electronic lab report. Electronic lab reports are word-processed reports submitted online (Devenport, 2006; Kidd, 2007; Overhage, Grannis, & McDonald, 2008), nothing more. *Digital lab reports* are completed on computers,

may or may not be online, and include the use of other media tools. Digital reports are often collaborative, may use probeware, digital camera shots, video from camcorders and screen shots. Students can present their findings using applications such as iPhoto, iMovie, Keynote, PowerPoint, Inspiration, Audacity, and Zoho (Ahlborn, 2005; Mader & Smith, 2007). Along with the easy inclusion of images, digital reports found online are advantageous over electronic or handwritten lab reports in that they are searchable and may include references with hyperlinks (Johnson, 2008; Laboratorytalk editorial team, 2007).

VoiceThread

Pictures, documents, and videos can be uploaded into an online media album, called a *VoiceThread*, where comments can be made by means of microphone, telephone (including cell phone), webcam, audio file, or text. Once students post visual media, they can type text or record narrations, and even include doodling by drawing lines or circles to direct attention to specific images. Peers can give each other verbal or text-based feedback, and teachers can comment directly on the VoiceThread as they assess student work. This easy to use application, developed at the University of North Carolina, creates animations that can be exported for MP3 or DVD playing, shared by links, or embedded into established websites (EDUCAUSE, 2009; VoiceThread, 2010).

Why Use Digital Lab Reports?

Schlechty states that an engaged learner is "one who pays attention and shows commitment to activity because he or she *believes there is value in completing the task"* (as cited by Dooner et al., 2010, ¶ 4). Middle grade students want to be engaged in projects that use

technology as a tool to learn new information. They desire school experiences to be "more directly related to careers that they might have in the future" (Spires, Lee, Turner, & Johnson, 2008, p.509) and more interactive and media-oriented.

Lab reports are training into what scientists do, apprenticeships, allowing students to be more like members of the science community. Carter, Ferzli, and Wiebe (2007) found that direct and indirect learning take place when students write lab reports. Lab reports allow students to make connections between concepts presented in lectures and applied in labs. Students that completed lab reports, written in their own words, found the reports to be easier to understand than lectures, lab manuals and textbooks, and felt that they would use the reports as references in the future. They did better on exams and wrote better reports elsewhere. Overall, students stated that they learned the material better and in more detail because of the writing they had to do in the labs.

Lab reports also enable teachers to find out what their students understand, but writing lab reports is difficult for middle school students. Mullen (2003) states, "It appeared that students were only interested in the final grade on the report. They did not pay attention to what the lab was about or consider areas of weakness that they should improve upon. As a result, the next set of lab reports would come in with the same errors and the process of grading them would start all over again" (p.7). This is a frequent occurrence even among middle school students who typically receive good grades. Students at this age are literal, and will include what they think the teacher wants. They may have every lab section required, but they do not pay attention to details. Lab report entries include poorly drawn tables, misspelled words, and discussions that are fragmented and unintelligible. Typing digital lab reports gives students

access to tools to create tables, correct spelling and grammatical errors, plus the added benefit of eliminating bad handwriting.

The TPCK (Technology, Pedagogy, Content, Knowledge) framework "argues that learning environments that allow students and teachers to explore technologies in relationship to subject matter in authentic contexts are often most useful." (Mishra & Koehler, 2006, p.1045) Nelson, Christopher, & Mims (2009) "suggest integration of Web 2.0 technologies, utilized by skillful teachers, can promote student learning and facilitate the development of lifelong skills such as collaboration, creative thinking and knowledge construction" (p.80).

Digital lab reports give students experiences with a genre of writing specific to science and engage students in technology where they may choose how they present information.

Why Use VoiceThreads?

Ed.VoiceThread is a web-based communications network established for K-12 students and educators to create and collaborate on VoiceThreads. Students who are part of this network cannot invite participation from anyone who is not part of the Ed.VoiceThread network. There is no software to download, install, or upgrade.

VoiceThreads give options. As previously stated, students can upload documents, images and videos, and they can make comments by means of microphone, telephone, audio file, or text; but the ability to use a microphone is especially significant. It has been shown that learning disabled students produce longer, higher quality stories with fewer grammatical errors when the stories are dictated (MacArthur & Graham, 1987). It stands to reason that the same would hold true for a lab report discussion, which is a story in its own right about an experiment that took

place. Students who have difficulty with spelling and punctuation, or handwriting that is slow and less legible, will also benefit from composing orally (De La Paz, 1999).

Decisions must be made on what will go on each slide or page of the VoiceThread. Inclusion of pictures or video requires students to take responsibility for acquiring and using cameras. If they want to include images, students need to perform searches through clip art and insert them. Typing can be done as comments within the VoiceThread or in a PowerPoint that is uploaded to the VoiceThread. Yair states that providing choice helps students make independent and self-directed decisions in their learning. "Students' intrinsic motivation is highly correlated with the structure of instruction, which suggests that the more choices students have, the higher their enjoyment and interest in learning" (as cited by Albrecht, Haapanen, Hall, & Mantonya, 2009, p.47).

Conclusion

A lab report is an effective means for students to make connections between an experiment and science content; however, the lab report is a form of technical writing difficult for middle school students. Submitted reports are frequently in disarray, incomplete and contain discussions that make no sense. A digital format will enable students to become more aware of mistakes and more critical of what they include in the report. Most spelling and grammatical errors will be indicated by the word processing application if typing is chosen. The option of narration affords students with writing difficulties a faster way to compose their thoughts. Tables, inserted rather than drawn, will have square corners and straight rows. Experiments can be documented with captured images and video.

The choice of digital tools is also important. In addition to giving many options, students

need them to be simple to use. This makes using VoiceThreads ideal. Creating a VoiceThread is instinctive, even for a novice with technology, and the possible combinations are unmatched by any other media application.

By using VoiceThreads to write digital lab reports, I hope to see students not only write better discussions, but also be engaged to the point where their enthusiasm is displayed as they personalize and complete their reports.

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